DIE CASTING ENGINEER

JUNE, 1959

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- **SELECTION OF DIE CASTING LUBRICANTS**
  Increase production and die life.—Page 7

- **FIXTURING ALUMINUM DIE CASTINGS IN A TUMBLING BARREL**
  Fixture an entire barrel load of parts remote from the barrel.—Page 11

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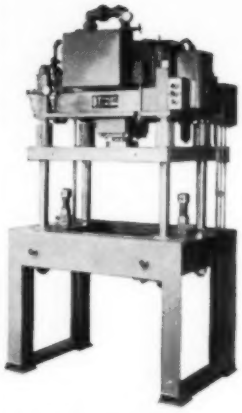

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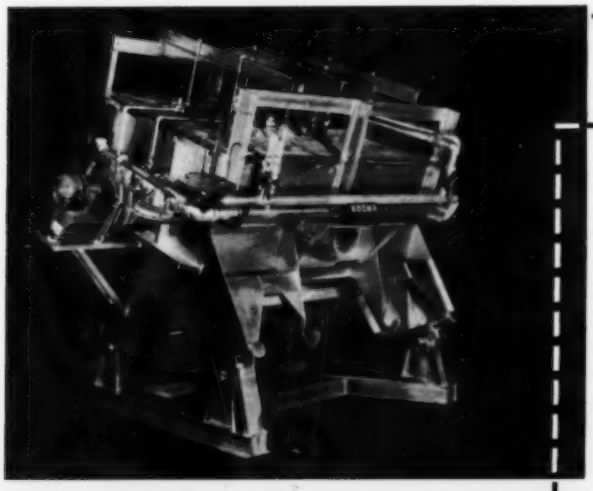

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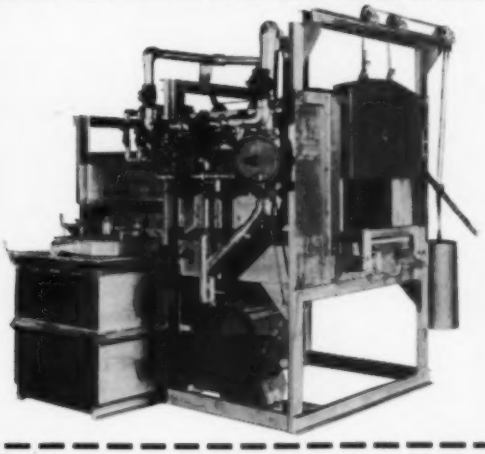

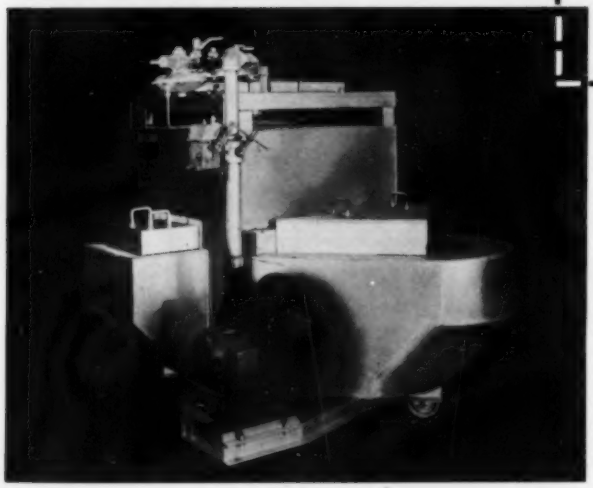

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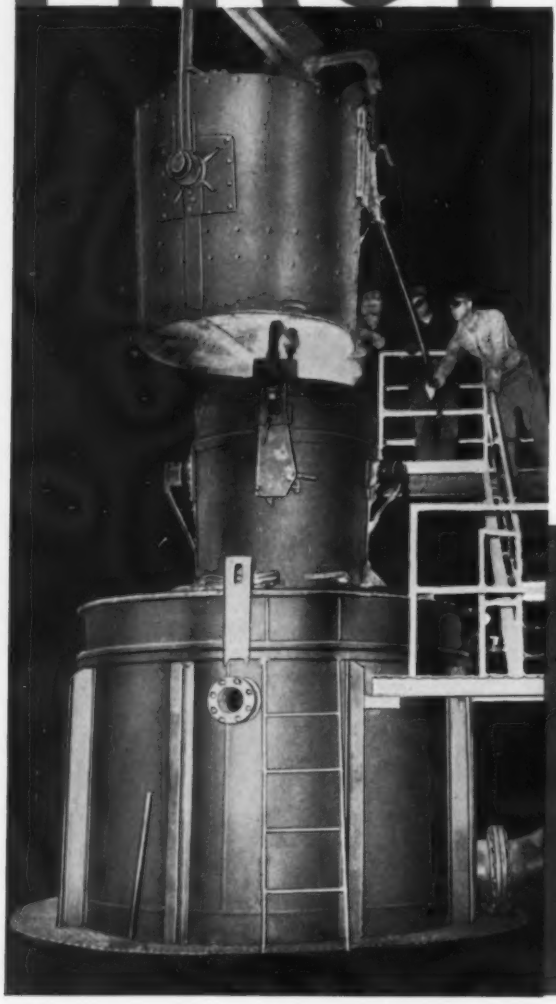

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Editor

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Associate Editor

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COVER

Holland, Michigan is the tulip capital of the United States. Each spring, with the blooming of the tulips, the residents of Holland stage a Tulip Festival, portrayed in an old Dutch atmosphere. Our cover photo shows two wizened Holland residents surveying the tulip fields, with a working replica of a Dutch windmill in the background. Holland, Michigan is the home of SDCE Chapter 3.

The DIE CASTING ENGINEER is published quarterly by The Society of Die Casting Engineers, Inc.—a society for the improvement and dissemination of the knowledge of the arts and sciences of die casting, the finishing of metals, and the allied arts. The DIE CASTING ENGINEER offers a concentrated coverage of management and engineering in the die casting and directly related industries.

Only advertising pertaining to die casting and finishing of metals and the allied arts is acceptable. The Society reserves the right to reject any advertising deemed objectionable for any reason what-so-ever.

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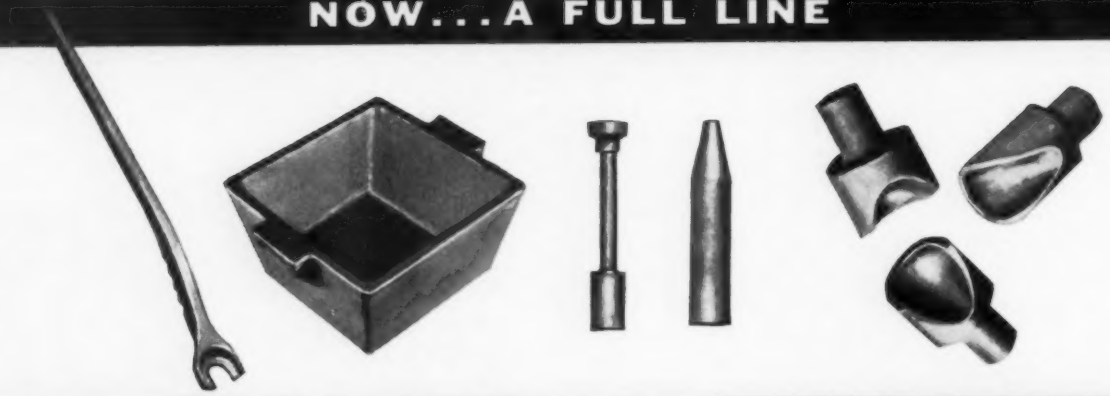

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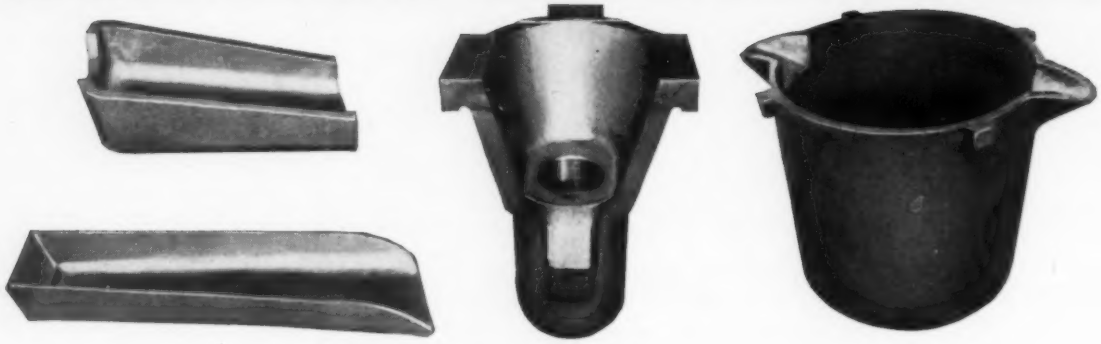

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SELECTION OF DIE CASTING LUBRICANTS

by **WILLIAM C. KENNEDY**
Technical Coordinator
and **EDWARD A. DAY**
Sales Manager
American Charcoal Company
Detroit, Michigan

MACHINED or ground die cavity surfaces will bear tool marks no matter how finely surch surfaces are subsequently polished. A powerful magnifying glass readily reveals tool traces as peaks and valleys. Microscopic globules or droplets in a release agent are expected to fill in and level off these valleys and so reduce the friction which impedes the flow of molten metal over die cavity surfaces. Pigments contained in some release agents settle in these valleys and perform a function similar to that of the oil globules or droplets.

Release agents, when formulated from the proper high temperature and high pressure oils and properly applied, form a boundary film between molten metal and die cavity metal to preclude solder and drag if these effects are not produced by undercuts in cores and cavity surfaces.

Some finished die cavity surfaces are more suitable than others for the retention of release agents. Little anchorage for the release agent is provided on a surface which is too highly polished such as might be produced by diamond polishing. Uniform mat finish on die cavity surfaces produced through electronic disintegration methods is particularly suitable. Cavity surfaces produced by conventional methods hold the middle position of acceptance.

Conditioning die cavity surfaces

Usually many shots must be made in a new or reconditioned die before the die cavity surfaces acquire that characteristic run in finish that prepares the die for full production unimpeded by excessive erosion and solder. For the running in period, an old practice dictates that a thin film of carbon should be built up on all working surfaces of the die, and this is done by burning on carbon with a smoky torch or through the use of kerosene as an interim release agent. Advanced thinking suggests something quite different.

Depending on surface finish requirements and specified dimensional accuracies, die casting dies may go into service with the oxidized surface produced by heat treating, or they may require clean-up machining and polishing. Oxidation of the surface which results when steel is heated may vary from the temper colors, which were widely used before the advent of the pyrometer to judge tempering temperatures, to the heavy flaky scale that builds up at high temperatures when no effort is made to protect the surface. Since the alloying elements in die casting die cavity steels are present primarily as carbides, they have relatively little effect on the amount of oxidation or the composition of the oxide formed. If it becomes necessary to machine and polish after heat treatment, it is often good practice to re-temper the die cavity at 600-900° F. to obtain a light oxide film. This film is achievable by a steam bluing treatment, also, the oxide layer is further built up in service as a result of the heat plus contact with release agents and molten metal. Although very thin, the resulting complex ferric oxide and carbide surface of a well seasoned die cavity surface acts as a protective film to reduce erosion and pitting and to minimize the tendency of castings to stick in the die cavity.

There are proprietary products on the market today serving two purposes; firstly, they reduce run-in time from days to a few hours; secondly, they cure areas in the die cavity surface where velocity of molten metal has washed away the cured surface.

When cured surfaces are washed away, soldering is bound to occur and, in advanced stages, pitting and erosion develop. Spot curing or patching of the oxide film can be done with these products without interrupting production, making available a needed and sought after first aid. With a glove tip or small brush, a small amount of the spot curing medium is applied on the affected area between shots.

These products are usually applied to all working parts of the die while it is disassembled in the tool room. After assembly, these products are applied to the surfaces of the die cavities when the die cavities are face up. An intra-red gas heating element is used to raise the temperature in the die cavity surfaces to about 660° F. and that temperature is sustained for approximately fifteen minutes. This process is repeated two or three times until the characteristic run-in appearance occurs. With each application a noticeable change will occur in the color of the die cavity surfaces.

In the absence of infra-red heating elements, all cores are removed and hot zinc is ladled into the die cavities. When the zinc solidifies, it is knocked out and the ladling pro-

cedure is repeated two or three times. This produces a result similar to that produced by infra-red. Removed cores should be attached to a piece of wire and coated with the curing agent. Those surfaces normally in contact with molten metal during production should be immersed in a bath of hot zinc. This done, the cores can then be assembled in the die, and the die readied for hanging in the die casting machine for immediate resumption of production.

Selection and application of die casting release agents

The thin coating formed on the surface of a die cavity by a release agent consists of dispersed solids. These solids are purposely not removed during the refining process of hot work oils used in the die casting process. To ensure this coating will selectively plate and continue to form on the cavity surfaces, it is important that only oils which produce this result be formulated into release agents. Forming a protective film against normal impingement, the thin coating substantially reduces the tendency of molten metal to adhere to die cavity surfaces.

Lubrication of die cavity surfaces cannot overcome faulty workmanship or design in die cast dies, however, when the proper release agent is selected and properly applied, minor faults, such as superficial washout or undercuts, are rendered less troublesome. Improper lubrication and method of application only encourage further washout and undercuts.

The type of crude oil and the methods of oil refining influence the quantity of corrosive acids which develop during ultimate use in sustained high temperatures. Advanced distillation methods, deasphalting, dewaxing and solvent refining remove parts of the crude oil that readily become acidic. Over refining simply lowers resistance to formation of corrosive acids. Sufficient alkaline reserve is contained in oils that are incorporated into release agents and plunger lubricants to discourage the formation of acids and consequent pitting, erosion and corrosion.

Ingredients formulated into die casting release agents must not deteriorate in the average temperature range of 375 to 450° F. existing at the die cavity surfaces, nor in the momentarily increased temperature range of 575 to 700° F. at the die cavity surfaces where the molten metal enters. Active ingredients should plate out and adhere to the die cavity surface without cooking down to tars, coke and carbon. The most effective lubrication provided by a release agent is produced by a microscopically thin, uniform film sprayed on the die cavity surfaces with a pressurized or gravity feed spray gun.

It is usually necessary to extend a release agent with a thinning medium of solvent or water. The most suitable release agent and applicable extender will depend upon whether heat is to be retained or removed from the die cavity surfaces.

Heat loss by conduction and convection

Removal of heat from die cavity surfaces is accomplished by conduction or convection. Conduction removes heat through water lines built into the die, while convection simply diffuses the heat of the die into the environment.

When the temperature at the die cavity surfaces cannot be reduced sufficiently by natural convection, nor accelerated through the employment of the proper release agent, it is sometimes necessary to install piping atop both halves of the die and, through a series of fine holes, direct streams of water over the die cavity surfaces. Hard water scale and rust build up in water channels of die casting dies, impeding heat loss by conduction. Thermal control units employing formulated fluids rather than water as a cooling medium eliminate scale build up and provide absolute control over heat loss by conduction.

High speed single cavity or very high temperature operations may suggest the use of CO_2 instead of water or oil as a cooling medium for die casting dies. Generally the CO_2 lines are about ⅛-inch I.D. and located deep within the die and not less than two inches from a die cavity surface. CO_2 is provided by a small compressor installed at each machine or by a slightly larger unit operating as a central source for many machines. Thermostatic control at the outlet in the die permits CO_2 to be fed to the die steadily or intermittently. The CO_2 is always circulated from the die to a tank from which it is again drawn and routed back through the die on demand. CO_2 may also be used to cool an isolated spot in a die by drilling into the area and inserting a standard bayonet type return valve. Other applications holding great promise for CO_2 are in the die casting of brass and stellite where excessive die temperatures contribute toward short die life.

Heat loss by convection can be controlled by the extender used with the release agent. The higher the boil and evaporation of the extender, the slower will be the rate of heat loss by convection. As a general rule, the more viscous the release agent, the more heat retained in the die.

The initial boil point of an extender is that point at which evaporation begins. When an extender evaporates as a result of being applied to a hot surface, it possesses the ability to absorb and remove heat. This is clearly illustrated when we apply alcohol to our hands. As the alcohol evaporates, the area of the hand to which it was applied feels cool. A direct relationship exists between evaporation and distillation. The extent of evaporation or distillation is measured as a per cent at so many degrees of temperature. One hundred per cent distillation at so many degrees indicates that point at which distillation is complete. This point is referred to as the "end point," and in release agents, it is a very important factor in the control of die cavity temperatures and in the elimination of porosity in castings.

The following chart is intended to illustrate the end point of some diluents commonly used with die casting release agents.

END POINTS OF COMMON RELEASE AGENT DILUENTS

DISTILLATION	WHITE KEROSENE	# 140 SOLVENT	STODDARD SOLVENT	WATER
Initial Boil Point	345° F.	364° F.	315° F.	212° F.
10%	372	368	323	...
50%	413	374	335	...
90%	463	387	358	...
End Point	502	399	378	212

From the above chart it is obvious that due to its low end point, more heat will be removed through convection in a given period of time from a 450° F. die cavity surface with water than with kerosene, # 140, or Stoddard. The above chart also suggests that an extender having an end point of less than 450° F. will completely evaporate before a die cast die has a chance to close for the next shot of molten metal. If the end point is in excess of 450° F., evaporation will take place in the closed die as the temperature increases momentarily with the entrance of molten metal. The resulting gases will be enveloped by the molten metal to form porosity within the casting regardless of whether the casting operation is conventional or under vacuum.

An average die cavity temperature indicates some spots in the cavity are above the average temperature and some below.

With this in mind, a good rule of thumb is to determine the average die temperature, deduct approximately 50° F. and consider this as the maximum end point temperature of the diluent required to extend your release agent. The initial boil point of the basic release agent, or that part of the solution sprayed on the die cavity surface which does not evaporate, should exceed the average die operating temperature by approximately 50 per cent. Bearing both of the above in mind when selecting a release agent and a diluent will insure a very substantial decrease in entrapped gases and porosity in your castings.

When molten metal enters a die cast die cavity, it enters so quickly that the gases given off through continuing evaporation of a high end point diluent or a low initial point release agent are enveloped by and incorporated in the metal before they have a chance to escape. This is just as true in machines equipped with vacuum, delayed or controlled shot mechanisms, or thermal control units of either the water or oil variety as it is in conventional dies and equipment. The die cavity surface temperature increase is of course instantaneous and of short duration, but it is this increase which serves as the trigger for resumption of evaporation in the diluent or the release agent. Metal enters too quickly for this evaporation to occur ahead of the flow and for the vapor to be carried off through the vents or vacuum system.

Lower operating temperatures of thermal-unit controlled dies suggest greater porosity in the casting than is normal with conventional cooling, unless initial boil and end points of the diluent do not exceed the average operating temperature at the die cavity surface. Initial boil point of the basic release agent should be as high for this application as for conventional die casting methods.

At one point or another most organic liquids will boil. At a given point and within a given time, the complete mass will either disappear as vapors, or a portion will vaporize leaving a more concentrated solution. Increasing temperature and time will result in further evaporation until we reach a time and temperature factor where nothing remains but fragmental ends or tars. These residual ends will ultimately progress, with cooking and stewing, to form carbon. In die cast release agents, occurrence of this carbonaceous deposit presents one of the most costly headaches in the entire process. It necessitates removal before it progresses to the point where it affects finish, alters dimensions, interferes with ejection, provides an anchor for solder and ultimately, drag and distortion. In deep recesses or blind bosses, it will even prevent proper fill-out as carbon tends to repel molten metal.

Water extendable release agents

Water extendable release agents fall into two separate and distinct categories, the true emulsion and the inverted emulsion. A droplet of true emulsion consists of an oil center enveloped by a thin layer of water. A droplet of an inverted emulsion possesses a water center enveloped by a thin layer of oil. A true emulsion concentrate may be added to water or water may be added to the concentrate. An inverted emulsion should be added to water else a separation is apt to occur.

The outer water shell on droplets of a true emulsion will evaporate immediately on contact with a hot die surface, leaving a thin, uniform film of oil on the surfaces of the die cavity. When the outer shell of an inverted emulsion droplet contacts a hot die cavity surface, it will dance and bounce wildly and ultimately gravitate to, and bubble and boil on, the nearest horizontal surface. If the droplet drops into a deeply cored area, excessive porosity and probably oil shot will occur in the casting.

The cause of all this activity and turbulence in an inverted emulsion droplet can be traced to die cavity temperatures and the structure of the droplet. Water, which boils at 212° F., is trapped within an oil envelope probably having a boiling point of 550 to 650° F. Like an angry cat enveloped in a balloon, the water is desperately trying to escape the oil and its efforts are not blessed with much success. Hence, the bubbling and dancing are apt to leave some parts of the die cavity surface barren of lubrication while other parts are excessively lubricated. Solder, drag, stickers, excessive erosion or pitting on die cavity surfaces, slides, movable cores, bosses or other protuberances may also result from continued use of such a product. Prematurely worn pins may also occur as a result of the failure of the dancing, bubbling droplets to either coat and adhere to extended ejector pins or to penetrate the pin hole.

Application of release agents

Some die casters evaluate a release agent on the basis of the number of shots that can be made between each application of release agent. They do not consider the value of heat loss or heat retention through convection, and the part played in this phase of die casting by a release agent.

Proper quality control dictates uniformity in the quality of castings. It has been proved conclusively in automated die casting operations that, when every cycle is identical to the previous one, the castings too will be uniform. Any deviation from this principle, while not always visible to the naked eye, will produce adverse effects in both castings and the die.

If the die is to be sprayed between every shot of metal, lubricity in the release agent must be reduced to a minimum with a diluent else oil shot will occur on the casting.

Of equal importance to the selection and extension of a release agent is the manner in which it is applied. Many zinc die casters are using an inexpensive single stage, syphon spray gun with an adjustable nozzle to provide any type of spray mist required. Two hose lines are attached to the gun, one accommodates straight line air pressure and the other is inserted into, or attached to, a square gallon can which contains the release agent. A full gallon should provide a consistent solution for an entire shift.

Many aluminum die casters are now using a two-stage spray gun with an adjustable nozzle. The guns may have either a pressurized, syphon or gravity feed. Special nozzle adapters are available for installing extensions on the spray gun, if needed. On large dies these extensions keep the arms and shoulders of the operator out of the die area.

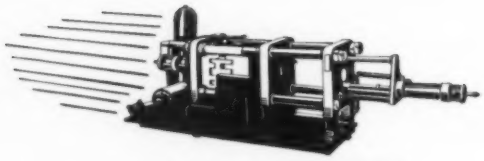
As a general rule, release agents are applied through the shot sleeve in cold chamber magnesium die casting machines. However, some magnesium die casters use the conventional lubrication method for both hot and cold chamber operations. Not infrequently, applying release agent through the shot sleeve of a cold chamber machine will also provide sufficient lubrication for the plunger tip.

Spray applying release agents can result in oil shot if too much lubricant is applied to the die cavity surfaces. Too much lubrication may be caused by holding the spray gun nozzle too close to the die surfaces or by using a release agent not properly extended. Holding the spray gun nozzle too close, usually less than 9 inches, to a die cavity surface can also cause cold shot.

Holding a spray gun under straight line pressure too close to core pins can overcool the pins. When the die closes and molten metal is injected, the pins will expand as the molten metal contracts during solidification. The opposing forces will cause binding over the core pins and may cause shrink cracks in thin walled sections.

EDITOR'S NOTE: *This is the first in a series of two articles on the selection of die casting lubricants. The second article by Messrs. Kennedy and Day will appear in the September issue of the DIE CASTING ENGINEER.*

announcement



CAST-MASTER

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We are very happy to announce that Cast-Master, nationally known manufacturer of die casting machines and allied equipment, is now a part of Koehring Company and will operate as a division of the Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. Designers and builders of precision die casting machinery since 1939, Cast-Master is one of the oldest exclusive manufacturers of this type of machinery in the country. The increased use of die cast parts in the automotive, appliance, electronic and many other industries forecasts a growth potential that will be strengthened by this union with the Koehring Organization.

The complete line of Cast-Master die casting machines will continue to be manufactured at the Bedford, Ohio plant. Operating Management at Cast-Master remains unchanged.

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FIXTURING ALUMINUM DIE CASTINGS IN A TUMBLING BARREL — An Improved Method

by JOHN J. MORRISON
Vice President
Roll Brite Corporation
White Plains, New York

WHERE a burnished finish is required on an aluminum die casting, the considerations which arise are whether to tumble the parts loose in the tumbling barrel or whether to fixture the parts so that their movement in the barrel is partially or completely restricted. Tumbling the parts loose is the simplest method, but sometimes a problem arises in separating the work from the finishing media. Another and more important problem is getting enough parts in the barrel to make the production per barrel load economical and still produce a satisfactorily burnished finish without too many nicks and scratches which might occur when the parts hit each other. Unless the parts are small and light, or unless the finish requirement is not high and a degree of nicks and scratches is not objectionable, loose tumbling of aluminum die castings is generally uneconomical when compared to fixturing parts in the barrel.

Design advantages

Many different methods have been developed for fixturing parts in a barrel. One of the more recent is the Roll Brite barrel which permits fixturing an entire barrel load of parts on a rack remote from the barrel and then loading the rack into the barrel so that, in effect, the barrel load of parts is handled as a unit. This design has many advantages in that the unproductive barrel loading and unloading time is kept to a minimum and, by being able to fixture the parts on the rack remote from the barrel, it is possible to utilize the entire volume of the barrel with the exception of the 3-inch diameter center rack supporting shaft. It also permits versatility in the methods used to fixture the parts and orient them closely together. The parts can be mounted within ½-inch of each other when ¼-inch balls and ball cones are used. A utility rack is supplied with the barrel so that it is possible to keep the tooling cost at a minimum for those parts that do not run in sufficient volume to warrant custom built racks. The center rack supporting shaft is removable so that the barrel can be used as a standard tumbling barrel for loose parts where this is practical.

Running time

Running time in the barrel varies from 30 to 60 minutes depending upon the surface condition of the castings and the fixturing time. Rough castings do not brighten up as quickly as smooth castings, thus rough castings require a longer running time.

The fixturing time is a balance between the manpower doing the fixturing and the nature of the parts being fixtured. In a production Roll Brite operation, some racks are filled more quickly than others due to a number of reasons, such as, the number of castings mounted on the rack, how elaborate the fixturing is in respect to ease of racking and unracking, the number of persons doing the racking and similar factors.

Illustrative of the Roll Brite process is the burnishing of the Esquire Shoe Care Bar. Consisting of five aluminum die castings, this assembly is burnished in a Roll Brite barrel for 30 minutes.

The complete process for the Esquire Shoe Care Bar is:
Solvent degrease
Hot caustic dip for 5 to 15 seconds @ 190° F.

Cold water rinse
Acid dip for 15 to 30 seconds
Cold water rinse
Hot water rinse
Spin dry
Rack parts
Load rack in barrel
Load balls, water and compound in barrel
Run barrel for 30 to 60 minutes
Unload balls
Unload rack
Cold water rinse entire rack
Hot water rinse entire rack
Spin dry
Unrack and pack

Simple cycle

The cycle is very simple and no skilled personnel is required. It is possible to eliminate the preparatory cleaning operation, but the finish is considerably darker and the variations in the color of the casting as it comes out of the die are usually still evident after burnishing.

Cleanliness of the system is most important for optimum results. The steel burnishing media should be kept rust free to prevent the formation of any rust pits on the surface of the media. Pits reduce the burnishing effect of the media by causing the media to scratch rather than roll over the work.

While the Roll Brite barrel is designed primarily for burnishing, its simplicity and ease of fixturing also make it practical as a deburring tool when used with abrasive media.

P. M. D.

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- Lowest cost of any vacuum system
- Proven in production
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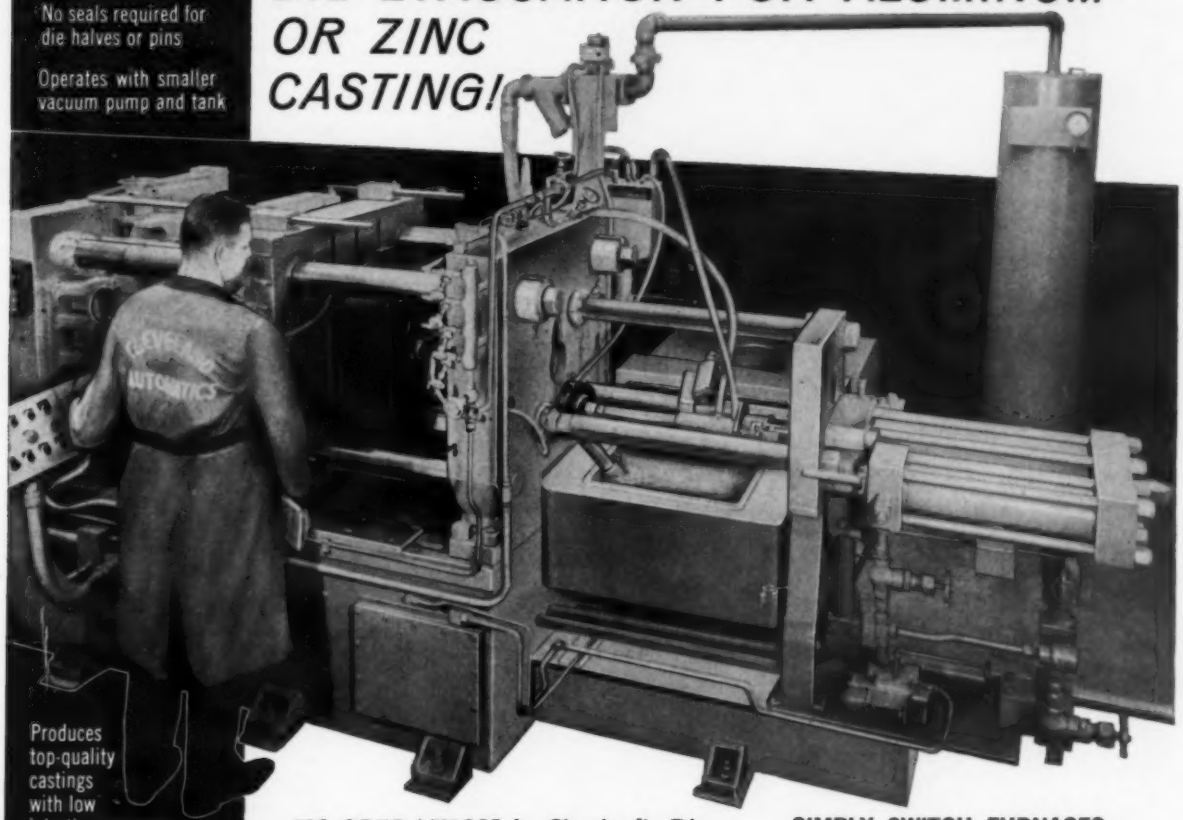
- No seals required for die halves or pins
- Operates with smaller vacuum pump and tank



- Produces top-quality castings with low injection pressures
- Provides fast operation with less operator attention
- Machine maintenance reduced to minimum
- Less flash—cleaner dies—fewer rejects
- Automatic die and machine lubrication including plunger tip
- Template-programmed operation sequences
- The ultimate in machine operation flexibility

IN OPERATION in Cleveland's Die Casting Development Center is the 400-ton Cleveland 400-N Machine shown above. This Cleveland incorporates the lowest cost, most efficient vacuum ladling and die evacuation system in existence today!

For months, this machine has been producing an extremely thin-walled aluminum casting, having near-zero porosity and superb surface finish, at rates exceeding 300 shots per hour.

The casting is produced with a 4" dia. shot cylinder from a 1000 lb. charge in the accumulator, and by automatically ladling the aluminum and evacuating the die and shot cylinder from the vacuum system, which operates under a vacuum of 29.6 inches of mercury. No shrouds or die seals, etc., are used. (If desired, a 2000 lb. shot pressure, or an intensifier to provide 5000 lbs., can be supplied.)

SIMPLY SWITCH FURNACES TO CHANGE FROM ALUMINUM TO ZINC PRODUCTION

Note the unique furnace arrangement shown. This is a 30KW induction melting furnace on wheels, riding on rails. The entire furnace can be rolled out from under the shot end. By mounting another die, rolling in a second furnace charged with a different alloy or metal, and re-programming the machine controls, this Cleveland is quickly back into production!

A few of the many advantages of Cleveland Vacuum Die Casting Machines are itemized at the left. To convince yourself of Cleveland's superiority in vacuum die casting, schedule your visit to see this machine in operation, or call in a Cleveland field engineer.

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Chapter News

NATIONAL

An International Die Casting Conference will be held in Stresa, Italy during May, 1960. The SDCE is organizing a tour to attend the conference and visit European die casting plants. The tour will be for members that are employed in die casting plants.

Further announcements concerning the conference will be made in future issues of the DIE CASTING ENGINEER.

1 DETROIT and 2 SAGINAW VALLEY

On April 7th, at the Devon Gables, over 70 persons attended the return engagement of Robert S. Hodder, Metallurgical Engineer, Latrobe Steel Company. Mr. Hodder discussed and compared the various steels and their properties, as required by the die casting industry. His slides graphically disclosed the capacities of the steels from the low alloy through the H-13 type now being used.

The May meeting of Chapters 1 & 2 featured a talk by J. C. Fox, an associate of Delos M. Palmer and Associates. Mr. Fox spoke on the "Use and Abuse of Die Casting Dies," a presentation relating premature die failure to die temperature, heat treatment, welding and attack of molten metal on the die surfaces.

The annual Stag Day Golf Outing of Chapters 1 & 2 will be Saturday, June 27th at the Pontiac Country Club. A full day of fun, food and fellowship can be had for only $10.00.

3 WESTERN MICHIGAN

Dinner, introduction of officers and visitors and a pleasant evening of dancing to the music of "Clifford Zinn and His Sentimentalists" greeted the members and guests of Chapter 3 who attended the Blow-Out, March 13th, at the Glen Ridge Country Club. This annual affair provided an evening of fun for all.

Robert L. Jenk, Director of Board Sales Service and Technical Director of Mead Containers was the featured speaker at the April meeting of Chapter 3. Mr. Jenk's topic was "Various Packaging Methods for the Safe Conduct of Castings to the Customer," a subject of interest to all die casters.

4 TOLEDO

"Proper Melting and Handling of Aluminum Can Save You Money" was the title of the talk presented by Ray Dunn, Lindberg Engineering Company, at the April meeting of Chapter 4. Mr. Dunn introduced many useful ideas for economies in the handling of aluminum casting alloys.

J. C. Petter, Vice President, B & T Machinery Company, spoke on "Vacuum Zinc and Aluimnum Die Casting" at the May dinner meeting of Chapter 4. Mr. Petter described research done in vacuum die casting at the B & T laboratory.

Chapter News

5 CHICAGO

The featured speaker at the April dinner meeting of Chapter 5 was Hugh Eldred, Lubrication Engineer, E. F. Houghton & Co. Mr. Eldred's subject was "Fire Resistant Hydraulic Fluids." His talk covered the how's and why's of fire resistant hydraulic fluids in the die casting industry.

"Vacuum Zinc and Aluminum Die Casting in the B & T Research Lab" was the title of the talk presented by J. C. Petter to the May meeting of Chapter 5. Mr. Petter is a graduate engineer and Vice President of B & T Machinery Company. The talk described work done in the lab on vacuum zinc and aluminum die casting, automatic machines, and how these processes work mechanically. Films and slides were shown to illustrate the talk.

June 23rd is the date of the annual Golf Outing of Chapter 5 at the Glendale Country Club, Bloomingdale, Illinois. Golf prizes galore, to be followed by a delicious steak dinner.

7 NEW YORK

"The Importance of the Independent Die Caster to the Automotive Industry" was the subject of a talk presented by Dr. George H. Found, Senior Staff Member, Metallurgical Engineering, Arthur D. Little, Inc., to the members of Chapter 7 at their March dinner meeting. Dr. Found reviewed the ways he believes the die casters will increase their contribution to today's market.

A panel discussion of the building of die casting dies was the highlighted feature of the April dinner meeting of Chapter 7. The panel members were Edward Arnao, George Beck, John Thomas, Bill Vach, Ray Moser and W. Gebauer. A lively question and answer period followed the panel's presentation.

18 NEW ENGLAND

Dr. George H. Found, Senior Staff Member, Metallurgical Engineering, Arthur D. Little Inc., was the featured speaker at the March dinner meeting of Chapter 18. Dr. Found received his B.A. in Physics from Princeton and his Ph.D. in Metallurgy from Yale. "The Importance of the Independent Die Caster to the Automotive Industry" was the subject of Dr. Found's talk. He pointed out the problems that the die casting industry will face in the future, and he suggested a few ways to face them.

The April meeting of Chapter 18 featured a plant trip to the General Electric Company, Meter Department, Somersworth, New Hampshire. An informative plant tour and a film on automation made an enjoyable trip for all. At the dinner meeting following the trip, Earl Mason, Executive Secretary of the SDCE, outlined the future projects and operations of the national offices.

Glenn R. Morton, owner of Morton Manufacturing Co. and president of Morton Engineering, Inc., was the featured speaker at the May meeting of Chapter 18. Mr. Morton's talk, "The Morton System of Vacuum Die Casting," presented the advantages of vacuum die casting and explained the Morton method for self-feeding the metal.

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DIE CASTING MACHINES FOR SALE

1—B & T—1953. 400 Tons. Aluminum. $11,000.00

2—Gen. Motors, 150 tons Zinc, 18½" x 18½" centers. Rebuilt, new Goosenecks & plungers. $3,500.00 to $4,500.00.

4—Cleveland #400. Alum. 1950 and Zinc 1952. Good shape. Each $10,000.00.

2—Lester Hp3, 600 tons. Aluminum and one Zinc. Just completely rebuilt. Each $12,500.00

1—Cleveland #50, 50 tons Zinc. Little used. 1952. $4,500.00.

1—Kux HP35 Alum V 500 tons. Little used. 3 new shot sleeves. $14,000.00.

1—Kux BH30 Zinc. 400 tons. $8,500.00.

2—Kux BH18 Zinc. 300 tons. Rebuilt last year. $6,500.00.

1—Kux BH12 Zinc. 80 tons. 1952. $4,500.00.

1—Eckstrom-Carlson, Rockford, Ill. 800 tons, Alum. Rebuilt, and a fine machine. $25,000.00.

1—Reed Prentice #2, 400 tons Alum. 1950. $11,000.00.

2—Reed-Prentice #1½ Zinc. 225 tons. 1950 rebuilt. Each $7,800.00

2—ABC Zinc Casters in good shape. Each $1,500.00.
and many others.

Induction & Gas Furnaces from 400-2,000 lbs. cap.

1—Nitrogen pressure flask, drawn from one piece of Steel. 2,000 psi. 24" dia. x 13 ft. long with valve. Tested by Lloyd.

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— NEW BOOKS —

The Physical Metallurgy of Magnesium and Its Alloys—G. V. RAYNOR. 531 pages. Index. Pergamon Press, Inc., 122 East 55th Street, New York 22, New York. 1959. $12.50.

The technology of magnesium, its physical and theoretical background, are treated in Dr. Raynor's work, selectively, not exhaustively. He first lays the theoretical basis of today's magnesium industry and then erects the superstructure of its development for use in today's commerce and predicts more extensive use in tomorrow's, as production of high purity magnesium is made to increase and competitively gain on and come abreast of aluminum.

"At the present time," writes Raynor in his introduction, "cast magnesium alloys can compete with cast aluminum alloys, and are not unattractive at moderately elevated temperatures; aluminum alloys remain somewhat superior in the wrought form. In attempting to decide on the merits of magnesium for specific applications, it is natural that corrosion characteristics should exert an important influence. First, surface protection by chromate treatments and anti-corrosion paints is now well established, and improvements in the degree of protection continue. . . . Secondly, alloys with a high degree of resistance to corrosion may be obtained with the use of high purity materials, in which the iron, nickel and copper contents are very limited. . . ."

"If full benefit is to be taken of the more attractive features of pure alloys, the production of high-purity metal at an economic price is essential. At present it is doubtful whether metal of the required high purity is obtainable from the electrolytic reduction on a technical scale, and processes involving the reduction of the oxide with ferro-silicon may offer the better hope of purer metal becoming freely available," the good doctor declares, arguing that the research effort to produce magnesium-rich alloys to compare with aluminum-rich alloys would appear to be worthwhile.

Dr. Raynor's monographic review of the basis of magnesium technology is an effort to achieve better understanding of the problem of magnesium's progress.—Robert Trochet

Nuclear Engineering Handbook—Editor-in-chief HAROLD ETHERINGTON. 1809 pages. Index. McGraw Hill Book Company, 330 West 42nd Street, New York 36, New York. 1958. $25.00

For the first time, nuclear engineering is comprehensively covered in standard handbook form. The information is presented at a practical level for the interested engineer. Specific information and data are provided for those engineers who are interested in the industrial applications of nuclear energy. For those engineers who may be interested in the handbook purely for their own intellectual satisfaction, many interesting and informative discussions of nuclear technology are included.

The handbook contains four major categories of information: basic data in nuclear engineering, formulas and methods of calculation used in the design of reactors and in other phases of nuclear engineering, discussions of the present state of the technology and condensed descriptive reviews of nuclear theory and engineering principles. The four major categories are divided into fourteen major sections, each section having a separate table of contents. One comprehensive index serves the whole handbook.

The material in the handbook was compiled from the data and information supplied by more than 70 contributors, each a specialist in his particular area of nuclear science or engineering.—A.S.

— NEW BOOKS —

The Chemistry and Physics of Clays and Other Ceramic Materials, 3rd edition—ALFRED B. SEARLE and REX W. GRIMSHAW. 901 pages. Index. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, New York. 1959. $16.25.

The physical chemistry of clays or ceramics is treated extensively in this, the third edition of an already widely accepted reference work. Messr's. Searle and Grimshaw start with the historical development of ceramics and carry on through the most modern theories dealing with atomic structure and the prediction of physical properties.

Says Mr. Searle in the preface to the second edition, "Some years ago I endeavoured to follow Michael Faraday's method of 'selecting, co-ordinating, and publishing all the important facts that appertained to the advance of Chemistry and Physics in relation to clays and allied materials.'. . . So rapid has been the increase in the amount of information on the Chemistry and Physics of Clays and other ceramic materials . . . it is impossible for anyone to be engaged in active work and at the same time to read every statement on this vast subject. . . . It has been said that the stream of serious articles and books having some bearing on the chemistry and physics of ceramic materials continues at the rate of more than five thousand a year."

With the many new applications of ceramic materials, especially in the field of high temperature refractories, a compilation of much of the available knowledge on the physical chemistry of ceramic materials is a valuable asset to the engineer and designer. This book meets the above requirement and meets it quite handsomely. It is inevitable that a book of so wide a scope will be lacking in the ultra detail of any one particular system; however, it leaves no system completely untouched.—A.S.

Semiconductors—Edited by N. B. HANNAY. 767 pages. Index. Reinhold Publishing Corp., 430 Park Avenue, New York 22, New York. 1959. $15.00.

W. O. Baker, Vice President—Research, Bell Telephone Laboratories says that chemistry's cultural badges, its most elegant refinements, are purity and identity, and that these have come to new dimensions in semiconductor chemistry. The most nearly perfect and purest forms of matter processed by man have been made possible by zone melting and refining. Avagadro's number, as the number of atoms of a certain kind per cubic centimeter, for the first time becomes literal, at least over a range of 10^{10} in silicon and germanium crystals.

Some of Baker's justified lyricism is to be found trilling in every chapter of SEMICONDUCTORS, a book written to satisfy two kinds of readers; the first comprising chemists, whose major interests lie outside the field of solid state physics and chemistry, who desire to know more about this expanding field; and the second comprising chemists, physicists and metallurgists active in the field. What's in it for both kinds of readers? A general background of semiconductor physics and chemistry, chapters on the P-chem of semiconductor systems, on the relationship between the chemistry and the electrical and optical properties of selected semiconductors and on the properties associated with semiconductor surfaces.—Robert Trochet

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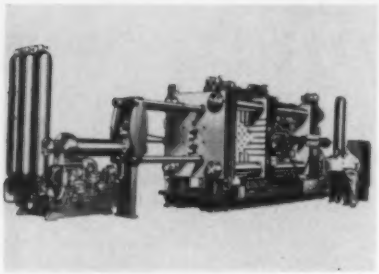
NEWS of the INDUSTRY

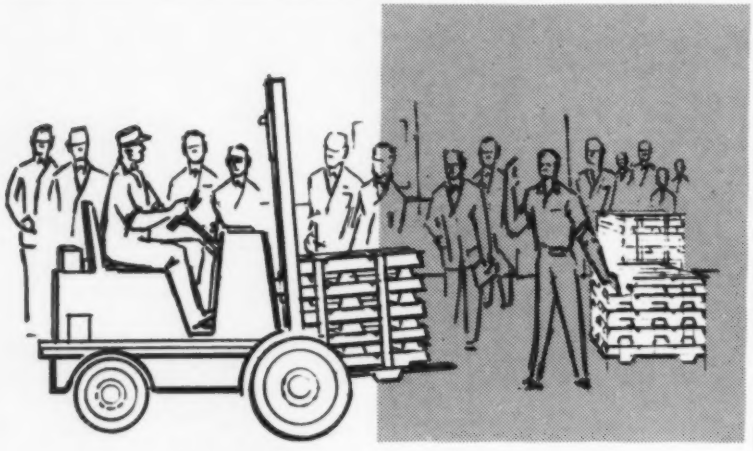


2000 TON CAST-MASTER CASTS 85 POUND ALUMINUM SHOT

This huge 2000 Ton Cast-Master die casting machine is the largest of nine standard size cold chamber machines now being built by Cast-Master, H-P-M Division, Koehring Company, Bedford, Ohio. It was designed and built especially for the production of extremely large castings such as automobile door frames, motor blocks, large housings and like parts. Aluminum castings weighing up to 85 pounds can be cast with this machine.

The rugged die toggle mechanism and extra heavy platens (18" x 80" x 80") and tie rods (11") will withstand extreme injection pressures and provide maximum locking pressure to all four corners of the die plate. The die stroke of the machine is 22" minimum to 36" maximum and the injection stroke from 30" minimum to 44" maximum. Space between tie bars is 51" both vertically and horizontally.

CIRCLE 15 READERS SERVICE CARD



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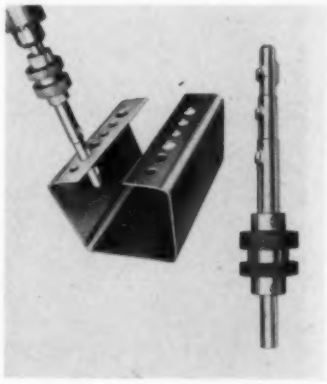
DOW CHEMICAL SPLITS MAGNESIUM SALES

The Dow Chemical Company announced a reorganization of its magnesium sales organization into two separate groups. The purpose of the change was to permit greater concentration of effort in specialized markets.

Dow Magnesium sales will be divided between a Metal Sales Department, which will specialize in the sale of primary metal, alloy ingot and cast anodes, and a Magnesium Products Sales Department, which will concentrate on the sale of sheet, extrusions, sand and die castings and fabricated products.

CIRCLE 16 READERS SERVICE CARD

SINGLE NOBUR TOOL DEBURRS 3 DIFFERENT HOLE SIZES

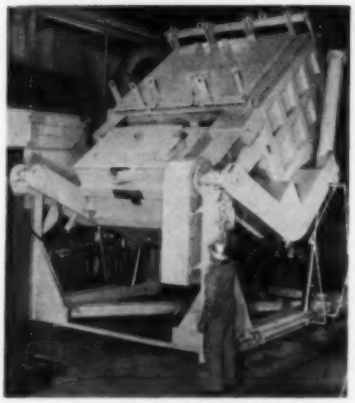


A single NOBUR tool that deburrs 3 different hole sizes was recently developed by the Nobur Manufacturing Company, North Hollywood, California, manufacturers of deburring and chamfering tools. The special NOBUR tool has three separate pilot diameters and a cutter blade with three correspondingly positioned heads. It is used in a portable drill-motor, and it precision deburrs the front and back hole faces of three different size holes without separate tool changes. As a safety feature passage of the tool through to the working hole surface is made with the cutter retracted.

CIRCLE 17 READERS SERVICE CARD

INDUSTRY

NEW 30,000 LB. ALUMINUM HOLDING FURNACE



A new 30,000 lb. aluminum induction holding furnace with a 3-section hydraulically operated cover was introduced by the Melting Furnace Division, Lindberg Engineering Company, Chicago 12, Illinois.

This heavy duty unit is designed for continuous service. The shell is mounted on heavy duty bearing trunnions and supported on structural steel legs. A monolithic chamber lining is non-wettable to aluminum. The pouring lip is located in the axis of tilting, providing a constant pouring arc regardless of the furnace tilt. The constant pouring arc eliminates the need for shifting the mold or ladle during pouring.

CIRCLE 18 READERS SERVICE CARD

REED-PRENTICE INTRODUCES 600 TON COLD CHAMBER ALUMINUM MACHINE

A new 600 ton die casting machine manufactured by Reed-Prentice Division of Package Machinery Company, East Longmeadow, Mass., is designed for all types of cold chamber casting. Hand ladling, automatic ladling or automatic feeding through the Reed Vacufeed system can be utilized.

Aluminum die castings weighing up to 10 lbs. can be produced on this new machine. The die stroke is adjustable from 12½ to 18½ inches. Die plates measure 47 x 46½ inches, giving 28½ x 28½ inch clearance between tie bars. Strain gage tested die locking pressure is 600 tons.

CIRCLE 19 READERS SERVICE CARD

MOBILE ULTRASONIC CLEANING SYSTEM

A mobile ultrasonic cleaning system, mounted on rubber-tired wheels, is now being manufactured to order by Acoustica Associates, Inc., Mineola, New York. The units can be easily pushed from one location to another for use wherever electric power is available.

Cleaning tanks up to 75 gallon capacity and ultrasonic power generators in ratings up to 2500 watts can be provided. Power may be derived from a 115 volt or 220 volt a.c. outlet. Cleaning time for most items is less than one minute.

CIRCLE 20 READERS SERVICE CARD

NOW SAVE ON SHORT RUN DIE CASTINGS!

59-H

D-M-E Standard UNIT DIE for ZINC and ALUMINUM Die Casting

Lower Die Costs
•
Change Dies in Minutes
•
Replacement Units in stock

The new D-M-E Standard UNIT DIE lets you change dies in *minutes* – lets you save valuable time on short-run die castings!

Standard 9⅞" x 11⅞" Replacement Units are *open on three sides* for waterline or core slides. Available with either Rack and Pinion or Bumper-type ejection.

Replacement units in stock now for immediate delivery. Get complete specifications and prices – *today!*

DME DETROIT MOLD ENGINEERING CO.
•
Branches: Detroit, Hillside, New Jersey, Chicago, Cleveland, Dayton, Los Angeles and Toronto, Ont.

CIRCLE 21 READERS SERVICE CARD

Attention Die-Builders!

SLASH NEW DIE-CURING TIME FROM 3-WEEKS TO 3-HOURS!

NOW! Dylube #710 offers the die-caster "run-in" UNIFORMLY conditioned new die cavities. Dylube #710 provides a new coating process that's been job-proven by leading die-builders and die-casters. Conditions a green die for immediate trouble-free production; prevents undercuts; erosion; pitting; stickers and drag. Facilitates metal flow, overcomes many gating deficiencies and solder.

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And Information On Dylube #710

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201 SOUTH GREEN STREET DETROIT 17, MICHIGAN

CIRCLE 22 READERS SERVICE CARD

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TOOL AND MOLD CORPORATION

DESIGNERS & FABRICATORS

of

QUALITY MOLDS

for the

DIE CASTING INDUSTRY

Complete designing and engineering. Modern plant & equipment includes BG-21 4' x 6' & BL-3620 Keller Duplicators.

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BErkshire 7-0800

PEOPLE in DIE CASTING

Fred A. Kaufman

■ **Fred A Kaufman** has been appointed vice president and general manager of Universal-Cyclops Steel Corporation, Bridgeville, Pennsylvania. In this newly created post, he will have responsibility for the direction of sales activities and the operation of the Company's plants at Bridgeville and Titusville, Pa., and Coshocton, Ohio. Previously, Kaufman was vice president in charge of its Refractomet Division.

■ **Glen H. Ockenhouse** has been named plant metallurgist of Johnston & Funk Metallurgical Corporation, Wooster, Ohio, it was announced by Edward R. Funk, company president. Johnston & Funk is a subsidiary of Mallory-Sharon Metals Corporation.

In his new position, Mr. Ockenhouse supervises the activities of the company's vacuum melting department, quality control and development laboratory.

Mr. Ockenhouse is a 1953 graduate of Pennsylvania State University.

■ **Alfred B. Glossbrenner** has been named superintendent of the Conditioning Department of the Timken Roller Bearing Company's Steel and Tube Division. The announcement was made by E. S. Hoopes, Jr., general superintendent of the Steel and Tube Division. Mr. Glossbrenner first joined the Timken Company in 1949.

Glossbrenner has a B. S. from Lehigh University. He belongs to the Association of Iron and Steel Engineers and is past president of the Cleveland Chapter of the Material Handling Society.

E. L. Kemper

■ Carl F. Burling, Sales Manager, Industrial Heat Treating Division, Lindberg Engineering Company, Chicago, Illinois, announced the appointment of **E. L. Kemper** as manager, Salt Bath Furnace Division. Kemper was formerly with A. F. Holden Co., Detroit.

■ Appointment of **Hugo C. Johnson, Jr.,** as assistant director, product development division of U. S. Steel's commercial department, has been announced by Richard B. Lord, division director. Mr. Johnson, a native of Buffalo, New York, had been a project manager in the division since April 1, 1958.

■ **Wayne Smith** of Erie, Pennsylvania, has been appointed to the sales staff of Detroit Mold Engineering Company, it was announced by L. J. Morrison, vice president in charge of sales. Mr. Smith will represent D-M-E in western New York, western Pennsylvania and Ontario, Canada.

■ **E. D. White** has been named vice president and general manager of the Union Die Casting Company, Whittier, California. White has been in the die casting field for 14 years and joined UDICO in 1954. His appointment highlighted a recent reorganization of company executives to assure more efficient production procedures and more effective sales promotion and advertising.

R. T. Eakin

■ **R. T. Eakin** has been elected to fill a vacancy on the board of directors of Latrobe Steel Company, according to an announcement by M. W. Saxman, president. Mr. Eakin is vice president of operations at Latrobe and joined the company last year.

Eakin graduated from Pennsylvania State University in 1940 with a degree in metallurgy. Prior to joining Latrobe, he held several executive posts at the Allegheny Ludlum Steel Company. He holds membership in the American Iron and Steel Institute, American Society for Metals, Society of Tool Engineers and American Iron and Steel Engineers.

■ New Staff changes at the Joseph Dixon Crucible Company, Jersey City, New Jersey, have been announced by Frank G. Atkinson, president.

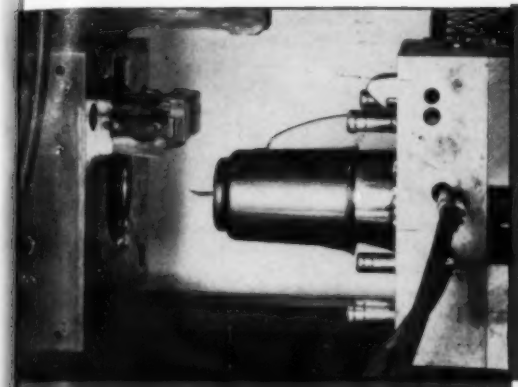
H. Edward Hines and **Warren A. Zimmer,** already vice presidents and veteran executives of Dixon, have been elected senior vice presidents, while **Sherwood B. Seeley,** technical director, was elevated to vice president in charge of research.

■ **Joseph A. Rzezutko** has been appointed production manager for the Detroit plant of the American Metal Products Company, it was announced by Ernst G. Ott, vice president in charge of manufacturing.

CIRCLE 24 READERS SERVICE CARD ⟶

names that mean

"*First Quality Guaranteed*"



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for

die casting dies

MC — The Mold and Cavity die steel made with particular care to permit blemish-free, highly finished surfaces. Furnished heat treated to 300 Brinell or annealed. Very deep hardening—uniform throughout large sections. Very low movement when oil quenched. For lower finishing costs and longer die life, use MC!

Speed-Cut — Free-machining at 300 Brinell. Choose Speed-Cut for economy in producing backing plates, cavity plates, spacer blocks and other plastic die parts. And when you must avoid *all* movement, machine Speed-Cut after hardening—with ease!

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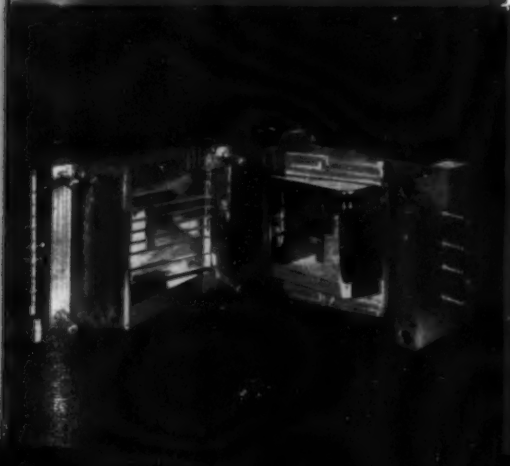

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PRETEMPERED AND HOT WORK STEELS FOR DIE CASTING AND EXTRUSION TOOLS
ALL SIZES IN STOCK
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DIE CASTING SERVICE AND PERSONNEL OPPORTUNITIES

As a service to the Die Casting Industry, we offer space in this section at $10.00 per column inch (1" x 2¼") or any fraction thereof, payable in advance.

Closing Date: 15th of month preceding publication.

To answer Box number advertisements, address responses to: Box ——, Die Casting Engineer, 19382 James Couzens Highway, Detroit 35, Michigan.

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The man I am looking for must have a background of practical experience and a record of accomplishments in Zinc and Aluminum Die Casting. He must be able to take complete charge of a high volume, well established, multi shift mid-west operation. This man must also have a firm conviction of his own capabilities and must have the initiative and intestinal fortitude to back up these convictions with successful accomplishments.

This is a golden opportunity for the right man. Remuneration will be in accordance with ability and accomplishment. Retirement and insurance benefits are among the best in the industry. If your qualifications meet our requirements send complete resume to Box 113.

We also require an experienced and qualified Foreman for building new tools, the follow through and development of these tools in production and the maintenance throughout model production.

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Technical Literature

■ **Magnus Chemical Company** has made available "Your Guide to Effective, Economical Metal Cleaning," a series of charts in a handy file folder form to simplify the task of selecting the correct cleaning method and chemical for the various metals and soils which are likely to be encountered in the metalworking and finishing industries.

CIRCLE 30 READERS SERVICE CARD

■ A 48-page technical bulletin, published by the **A. F. Holden Co.,** Detroit metallurgists, describes the firms new luminous wall combustion system for gas fired, infrared heat treating furnaces. Titled "Instantaneous Heat," it sets forth in layman's words the research story behind the luminous wall development, what it is, how it works, its present and future applications, versatility, and a glossary of terms used.

CIRCLE 31 READERS SERVICE CARD

■ The **Frederick Gumm Chemical Co.,** Kearney, New Jersey, is now offering its latest edition of the CLEPO Aluminum Finishing Manual. The reader will find a detailed discussion of many different problems concerning the finishing of aluminum as well as methods and materials for taking care of these problems.

CIRCLE 32 READERS SERVICE CARD

■ Centrifugal and rotary pumps for a wide range of industrial uses are described and illustrated in a 72-page, two color catalog just issued by the **Paris Products Division of Detroit Harvester Company.** Featured in the catalog are "Pioneer" open-impeller centrifugal pumps, in both sealed and sealless types, and "Rollway" mechanical positive displacement rotary pumps.

CIRCLE 33 READERS SERVICE CARD

■ The **Screw Thread Metrology Laboratories of Standard Pressed Steel Co.,** Box 1221, Jenkintown, Pa., have developed a simple-to-use checklist of fastener ills. Titled "Common Thread Fit Problems . . . their symptoms and detection," the pocket-sized folder lists seven fit problems, noting possible causes next to each and gaging devices needed to detect them.

CIRCLE 34 READERS SERVICE CARD

■ Publication of a new 450-page technical manual for the die casting industry is announced by the **American Charcoal Company** of Detroit, Mich. Entitled "A Visit With 500 Die-Casters," the new manual will contain the latest technical information on all phases of modern die casting: such as, quality control, die and equipment preventative maintenance, lubrication, plus hundreds of "Tricks of the Trade" never before published.

Copies are available at $10.00 per copy.

CIRCLE 35 READERS SERVICE CARD

Expires 8/15/59 **DIE CASTING ENGINEER** June 1959

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Company..... Kind of Business.....

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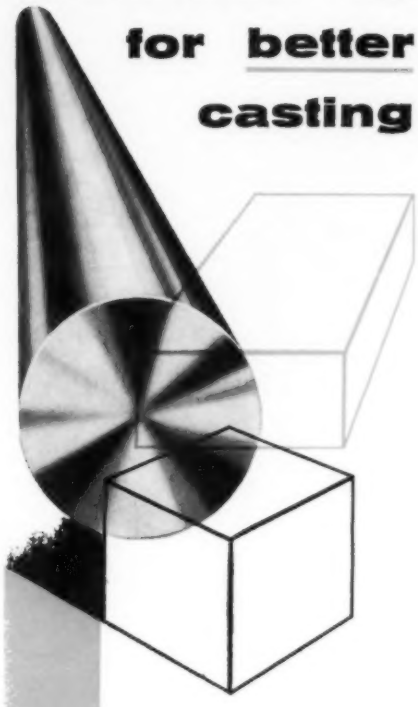

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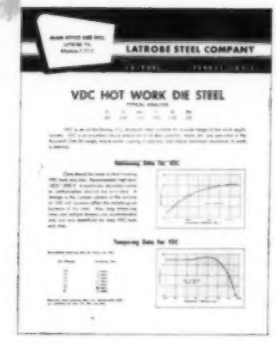
HOT WORK STEEL

Air hardening, high vanadium, Type H-13

Regardless of how intricate your zinc, aluminum or magnesium die casting job may be, Latrobe's VDC can fill your need for faster die production, longer runs and more economical parts production.

Easy to machine, VDC has a sound internal structure and freedom from porosity. It responds uniformly to heat treatment, can be water-cooled in service and possesses excellent resistance to impact, wash and heat checking.

For your next die casting die, use the die steel made by Metalmasters who *know* your requirements . . . VDC! A wide range of stocks is available from district warehouses located near you.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CIRCLE 26 READERS SERVICE CARD

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